

# SUPERIOR MATERIALS SCAN TOUR

United Kingdom, Denmark, Germany, The Netherlands

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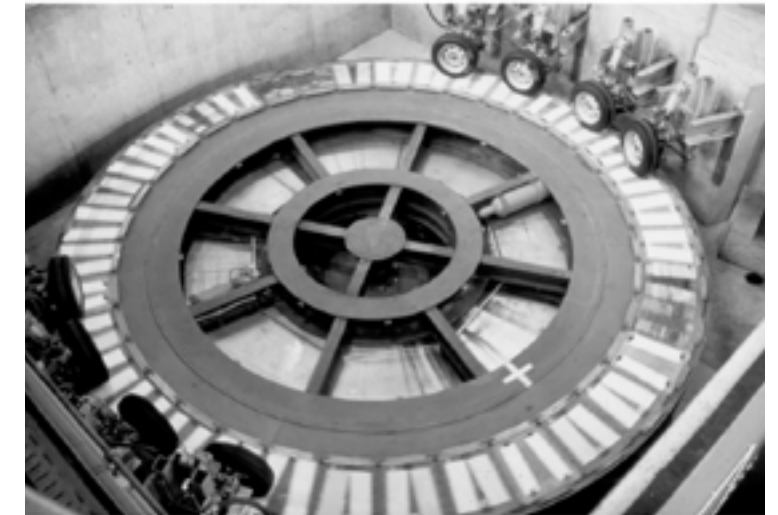
Work from what was learned on the scan tour continues. European processes and test methods under additional investigation for implementation include:

- Independent Non-Profit Materials Testing and Materials Qualification Foundations
- EOTA - Approval Process for Non-Standard Materials
- HAPAS - Highway Agency Product Approval Scheme
- Performance Bond Test for Tack Coat (UK)
- Pulse Thermography for Composites (UK)

The formation of the European Union (EU) has had a profound impact on most facets of government. By effectively eliminating barriers to free trade, there is now pressure for vendors and owners to move together towards standardized functional specifications rather than conventional prescriptive specifications. To assist in this effort, a central authority, the Comité Européen de Normalisation (CEN), was established to coordinate and manage the specification standards.

## ACCELERATED PAVEMENT MARKING SYSTEM TESTER

Due to the expense and logistics associated with field-testing of lane marking (stripe), Germany has developed a laboratory facility for accelerated lane marking evaluation. This facility is capable of evaluating tape, temporary paint, and permanent paint markings. Since the facility began testing in 1989, nearly 2000 materials have been tested. This specification can be found in CEN 13197.



Accelerated Pavement Marking System Tester - Germany

- Twin-Layer Asphalt – While porous asphalts have become increasingly popular, there have been reported difficulties with using them on lower-speed facilities. At high speeds, the traffic draws sand and other deleterious materials out of the pores, effectively resulting

***“Understand what we do, but don’t copy it. Unless, of course, you are The Netherlands.”***

*Jan van der Zwan, The Netherlands*

## NOISE REDUCING PAVEMENT DESIGNS

- Noise – Pavement type selection in Europe is greatly affected by the noise generated from vehicle-pavement interaction. With noise-reducing surfaces being required by many agencies, the industries were forced to quickly respond with viable and cost-effective solutions, or else face virtual elimination from the market. It was also noted that when the issue was first raised, the automotive, tire and highways industries began to work together to identify common solutions.

in a “self-cleaning” surface; however, this does not occur at lower speeds typical of many city streets. A twin-layer paving system has been advanced that includes a larger stone porous matrix in a lower lift, covered by a porous mix with a smaller top size for the wearing course. NAPA, the National Asphalt Pavement Association, recently published an article on the use of twin-layer asphalts.

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Roads to the Future – Rolled Pavement

### THE LAND OF UNINTENDED CONSEQUENCES, OR “BE CAREFUL WHEN YOU SPECIFY PERFORMANCE – YOU MIGHT GET IT.”

The Netherlands highway agency set a performance level on emptying garbage cans at the rest stops – at any given time, when inspected, garbage cans could be no more than half full. The agency figured this requirement would encourage frequent emptying of the garbage cans at the highway rest stops – not so! Instead, the private contractor sent one crewmember around in a small pickup truck and had them remove just enough garbage to reduce the garbage can to half-full – performance-based specification met! This resulted in extending the time between total emptying of the garbage cans, saving money for the contractor. Only once a week or more would the big trucks come and haul away all the garbage in the cans. The unintended consequence? Garbage would sit in the garbage cans for extended periods of time, resulting in voluminous quantities of “stink,” especially in the summer months.

### EUROPEAN UNION STANDARDIZATION

The European Union (EU), through its various commissions, boards, and associations, has structured ways that the individual countries

cooperate in promoting trade and commerce in the transportation and highway construction fields. The EU standard setting bodies addressing roadway and bridge construction are well into developing standards for many items including asphalt concrete pavements, Portland cement concrete pavements, and many other items. CEN focuses on standard materials and specifications, while the European Organisation for Technical Approvals (EOTA) deals with unique and unusual materials, construction techniques and specifications.

The process includes the development of functional specifications (commonly called end result or performance specifications in the USA), laboratory certification programs, and classes of service for various products.

### WARRANTIES AND PERFORMANCE CONTRACTS

All of the countries visited discussed the use of warranties and performance contracts as part of their everyday practice. The specific elements of these contracts varied, ranging from short-term (1-3 year) materials and workmanship warranties to long-term (30 year+) design-build-finance-operate (DBFO) contracts. While these types of contracts are common, there also appeared to be varying levels of comfort associated with them. Some

agencies appear more willing to relinquish control since they had seen an obvious increase in quality, while others appeared to be more cautious in their adoption.

While an increase in quality often resulted, innovation through the use of superior materials was not always realized merely because of a warranty mechanism. Use of superior materials was more common on the longer-term warranties, where the contractor had more latitude in the materials and processes that they could use. Where superior materials were used, it was found that the specifications were typically performance based. Difficulty in how to define the performance standard – what to measure, how to measure it, and when it should be measured, still remains.

In addition to warranty contracts, performance-based maintenance contracts were also in use. These contracts resulted in a privatization of the maintenance activities for a highway facility, and were normally accompanied by functional requirements. Momentum gained from the use of functional requirements for maintenance contracts has increased their use on conventional construction projects.

Warranties were combined with performance contracts, using a “trust, but verify” scheme. Once a general level of quality is verified, contractors bid on initial cost plus warranty duration plus traffic impacts, in an A+B+C scenario.

Finally, we noted that contractor quality was sometimes considered in the award process, as was life-cycle costing and sustainability (environmental impacts), quite distinct from a low bid process. These additional considerations led to innovative solutions for some contracts including the use of superior materials.

### PULSE (ACTIVE) THERMOGRAPHY

- The Building Research Establishment in the United Kingdom demonstrated an evaluation technique that is being deployed in the field to determine the bond effectiveness of composite laminate repairs (for structures). While all thermography techniques record the thermal

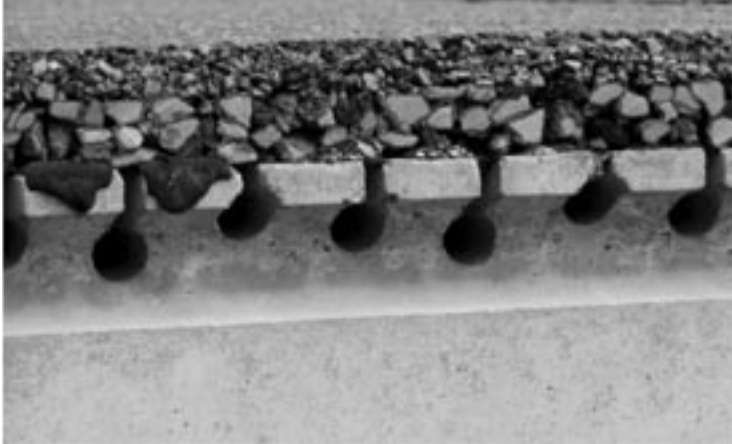
signature of a surface, this technique also employs an active heat source that, when pulsed, allows the evaluator to monitor the differential heat signature. The result is the ability to reliably view delaminated areas beneath a composite laminate.

### ROAD TO THE FUTURE

In the Netherlands, a novel approach to explore long-range solutions meeting future highway demands was presented. A “contest” was held with a number of highway functional requirements predefined (e.g. noise reduction and paving windows). To meet these demands, contractors were invited to offer solutions, no matter how unconventional. The tremendous response was found surprising to the agency, which selected a small number of them for further evaluation on a predefined test section. Four different techniques were tried including options with “precast” hot-mix asphalt surfaces that were laid down off of rolls (like paper towels).

### TORQUE BOND TEST

- Torque Bond Test – Identified by the Highway Agency in the United Kingdom, this test is used to evaluate the in-place bond effectiveness of thin wearing course systems. According to the Agency, a horizontal force is applied to a core taken through the pavement. A stud is then attached to the core surface and a force applied by a torque wrench. The force required for failure is noted as well as the location of the failure. For a well-bonded material, this failure occurs in within the underlying material, and not at the bonded interface.



Noise reducing composite pavement with Helmholtz generators in precast concrete slabs, with twin-layer HMA overlay